



REGULATORY GUIDELINES FOR DENTAL RADIATION MACHINES

REFERENCE - CODE OF MARYLAND REGULATIONS 26.12.01.01

May 2002

MDE

**RADIOLOGICAL HEALTH PROGRAM
AIR AND RADIATION MANAGEMENT ADMINISTRATION
MARYLAND DEPARTMENT OF THE ENVIRONMENT**

**1800 Washington Blvd.
BALTIMORE, MARYLAND 21230**

TABLE OF CONTENTS

Section A.2 Definitions	1
Section A.3 Exemptions	12
Section A.4 Records	12
Section A.5 Inspections	12
Section A.6 Tests	13
Section A.7 Additional Requirements	13
Section A.8 Violations	13
Section A.9 Impounding	14
Section A.10 Prohibited Uses	14
Section A.11 Interpretations	14
Section A.12 Communications	14
Section A.13 Units of Exposure and Dose	15
Section A.15 False Statements, Representations and Certifications	15
Section B.2 Definitions	16
Section B.3 Exemptions	16
Section B.5 Registration of Radiation Machines	17
Section B.7 Issuance of Notice of Registration	17
Section B.8 Expiration of Notice of Registration	18
Section B.9 Renewal of Notice of Registration	18
Section B.10 Report of Changes	18
Section B.11 Approval Not Implied	19
Section B.13 Out-of-State Radiation Machine	19
Section D.3 Definitions	20
Section D.101 Radiation Protection Programs	21
Section D.201 Occupational Dose Limits for Adults	21
Section D.207 Occupation Dose Limits for Minors	23
Section D.208 Dose to an Embryo/Fetus	23
Section D.301 Dose Limits for Individual Members of the Public	24

Section D.501 General	24
Section D.502 Conditions Requiring Individual Monitoring of External And Internal Occupational Dose	25
Section D.901 Caution Signs	26
Section D.1107 Records of Individual Monitoring Results	27
Section D.1201 Reports of Stolen, Lost, or Missing Licensed or Registered Sources of Radiation	28
Section F.2 Definitions	29
Section F.3 General Requirements	38
Section F.3(b)(2) Manual Processing	43
Section F.3(b)(3) Chemical-Film Processing Control	44
Section F.3(b)(4) Automatic Processors	44
Section F.3(b)(5) Film Fog Prevention	45
Section F.3(c) Quality Assurance	45
Section F.4 General Requirements for All Diagnostic X-ray Systems	46
Section F.4(a) Warning Label	46
Section F.4(e) Beam Quality	46
Section F.4(f) Multiple Tubes	48
Section F.4(g) Mechanical Support of Tube Head	48
Section F.4(h) Technique Indicators	48
Section F.6 Radiographic Systems Other Than Fluoroscopic, Dental, Intraoral, Veterinarian, or Computed Tomography X-ray Systems	49
Section F.6(a) Beam Limitation	49
Section F.6(b) Radiation Exposure Control Devices	50
Section F.6(d) Exposure Reproducibility	52
Section F.6(g) Additional Requirements Applicable to Certified Systems Only	52
Section F.7 Intraoral Dental Radiographic Systems	53

Section F.7(a) Source-to-Skin Distance	53
Section F.7(b) Field Limitation	53
Section F.7(c) Timers	54
Section F.7(d) X-ray Control	55
Section F.7(e) Exposure Reproducibility	55
Section F.7(f) kVp Accuracy	55
Section F.7(h) Additional Requirements Applicable to Certified Systems Only	55
Section J.11 Posting of Notices to Workers	56
Appendix A – The Dental Inspection Process	57
Appendix B – Partial List of Registered Service Providers	59
Appendix C – Reasons A Dental Facility May Notify the Agency	66

MARYLAND REGULATIONS

Section A.2 Definitions. As used in these regulations, these terms have the definitions set forth below. Additional definitions used only in a certain part will be found in that part.

The definitions are self-explanatory.

“Absorbed dose” [See “Dose”]

“Act” means the Annotated Code of Maryland, Environmental Article, Title 8 “Radiation”.

“Adult” means an individual 18 or more years of age.

“Agency” means the Maryland Department of Environment, Radiological Health Program.

“Annually” means either (1) at intervals not to exceed 1 year or (2) once per year, at about the same time per year (plus or minus 1 month).

“As low as reasonably achievable (ALARA)” means making every reasonable effort to maintain exposures to radiation as far below the dose limits in these regulations as is practical, consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed or registered sources of radiation in the public interest.

“Background radiation” means radiation from cosmic sources; naturally occurring radioactive materials, including radon, except as a decay product of source or special nuclear material, and including global fallout as it exists in the environment from the testing of nuclear explosive devices.

“Background radiation” does not include sources of radiation from radioactive materials or radiation producing machines regulated by the Agency.

“Calendar quarter” means not less than 12 consecutive weeks nor more than 14 consecutive weeks. The first calendar quarter of each year shall begin in January and subsequent calendar quarters shall be so arranged such that no day is included in more than one calendar quarter and no day in any one year is omitted from inclusion within a calendar quarter. No licensee or registrant shall change the method observed by him of determining calendar quarters for purposes of these regulations except at the beginning of a calendar year.

“Calibration” means the determination of (1) response or reading of an instrument relative to a series of known radiation values over the range of the instrument, or (2) the strength of a source of radiation relative to a standard.

“CFR” means Code of Federal Regulations.

“Collective dose” means the sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation.

“COMAR” means Code of Maryland Regulations

“Committed dose equivalent” [See “Dose”]

“Committed effective dose equivalent” [See “Dose”]

“Deep Dose equivalent” [See “Dose”]

“Dose” is a generic term that means absorbed dose, committed dose equivalent, committed effective dose equivalent, deep dose equivalent, dose equivalent, effective dose equivalent, external dose, eye dose equivalent, shallow dose equivalent, total effective dose equivalent, or total organ dose equivalent. For purposes of these regulations, “radiation dose” is an equivalent term.

(1) “Absorbed dose” means the energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the gray (Gy) and the rad.

(2) “Committed dose equivalent”(H_{T,50}) means the dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

(3) “Committed effective dose equivalent” (H_{E,50}) is the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to each of these organs or tissues ”(H_{E,50} = $\sum w_T H_{T,50}$)

(4) “Deep dose equivalent” (H_d), which applies to external whole body exposure, means the dose equivalent at a tissue depth

of 1 centimeter (1000 mg/cm²).

(5) “Dose equivalent (H_T)” means the product of the absorbed dose in tissue, quality factor and all other necessary modifying factors at the location of interest. The units of dose equivalent are the sievert (Sv) and rem.

(6) “Effective dose equivalent (H_E)” means the sum of the products of the dose equivalent to each organ or tissue (H_T) and the weighting factor (w_T) applicable to each of the body organs or tissues that are irradiated ($H_E = \sum w_T H_T$).

(7) “External dose” means that portion of the dose equivalent received from any source of radiation outside the body.

(8) “Eye dose equivalent” means the external dose equivalent to the lens of the eye at a tissue depth of 0.3 centimeter (300 mg/cm²).

(9) “Shallow dose equivalent” (H_S), which applies to the external exposure of the skin or an extremity, means the dose equivalent at a tissue depth of 0.007 centimeter (7mg/cm²) averaged over an area of 1 square centimeter.

(10) “Total effective dose equivalent “ (TEDE) means the sum of the deep dose equivalent for external exposure and the committed effective dose equivalent for internal exposures.

(11) “Total organ dose equivalent” (TODE) means the sum of the deep dose equivalent and the committed dose equivalent to the organ receiving the highest dose as described in D.1107 (a)(6)

D.1107(a)(6) refer to COMAR 26.12.01.01.

of these regulations.

“Dose equivalent” [See “Dose”]

“Dose Limits” means the permissible upper bounds of radiation doses established in accordance with these regulations. For purposes of these regulations, “limits” is an equivalent term.

“Effective dose equivalent” [See “Dose”]

“Embryo/fetus” means the developing human organism from conception until the time of birth.

“Exposure” means being exposed to ionizing radiation or to radioactive material.

“Exposure” means the quotient of dQ by dm where “ dQ ” is the absolute value of the total charge of the ions of one sign produced in air when all the electrons (negatrons and positrons) liberated by photons in a volume element of air having mass “ dm ” are completely stopped in air. The special unit of exposure is the roentgen (R).

“Exposure rate” means the exposure per unit of time, such as roentgen per minute and milliroentgen per hour.

“External dose” [See “Dose”]

“Extremity” means hand, elbow, arm below the elbow, foot, knee, and leg below the knee.

“Eye dose equivalent” [See “Dose”]

“Facility” means the location at which one or more sources of radiation are installed or located within one building, vehicle, or under one roof and are under the same administrative control.

“Gray” (Gy) means the SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (100 rad).

“Healing Arts” means a system of rules or methods of performing particular actions including the systematic application of knowledge or skill in effecting a desired result acquired by experience, study, or observation relating to the science of medical diagnosis, treatment, or surgery.

“Human Use” means the internal or external administration of radiation or radioactive material to human beings.

“Individual” means any human being.

“Individual monitoring” means the assessment of:

- (1) dose equivalent (a) by the use of individual monitoring devices or (b) by the use of survey data; or
- (2) Committed effective dose equivalent (a) by bioassay or (b) by determination of the time-weighted air concentrations to which an individual has been exposed, that is DAC-hours.

“Individual monitoring devices” means devices designed to be worn by a single individual for the assessment of dose equivalent.

For purposes of these regulations, individual monitoring equipment and personnel monitoring equipment are equivalent terms. Examples of individual monitoring devices are film badges, thermoluminescent dosimeters (TLDs), pocket ionization chambers, and personal air sampling devices.

“Inspection” means an official examination or observation including but not limited to, tests, surveys, and monitoring to determine compliance with rules, regulations, orders, requirements, and conditions of the Agency.

“Licensee” means any person who is licensed by the Agency in accordance with these regulations.

“Limits” [See “Dose Limits”]

“Member of the public” means any individual except when that individual is receiving an occupational dose.

“Minor” means an individual less than 18 years of age.

“Monitoring” means the measurement of radiation, radioactive material concentrations, surface area activities or quantities of radioactive material and the use of the results of these measurements to evaluate potential exposures and doses. For purposes of these regulations, “radiation monitoring” and “radiation protection monitoring” are equivalent terms.

“Occupational dose” means the dose received by an individual in the course of employment in which the individual’s assigned duties involved exposure to sources of radiation, whether in the

G.25 – refer to COMAR 26.12.01.01

possession of the licensee, registrant, or other person. Occupational dose does not include dose received from background radiation, from any medical administration the individual has received from exposure to individuals administered radioactive material and released in accordance with G.25, from voluntary participation in medical research programs, or as a member of the public.

“Person” means an individual, receiver, trustee, guardian, personal representative, fiduciary, or representative of any kind and any partnership, firm, association, corporation, or other entity. “Person” includes any public or municipal corporation and any agency, bureau, department, or instrumentality of state or local government and, to the extent authorized by federal law, federal government.

“Personnel monitoring equipment” [See “Individual monitoring devices”]

“Public Dose” means the dose received by a member of the public from exposure to radiation and/or to radioactive material released by a licensee or registrant, or to any other source of radiation under the control of the licensee or registrant. Public dose does not include occupational dose, dose received from background radiation, dose from any medical administration the individual has received, dose from exposure to individuals administered radioactive material and released in accordance with G.25, or dose from voluntary participation in medical research programs.

“Rad” means the special unit of absorbed dose. One rad is equal

G.25 – refer to COMAR 26.12.01.01

to an absorbed dose of 100 erg/gram or 0.01 joule/kilogram (0.01 gray).

“Radiation” means alpha particles, beta particles, gamma rays, x rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing ions. For purposes of these regulations, ionizing radiation is an equivalent term. Radiation, as used in these regulations, does not include non-ionizing radiation, such as radiowaves or microwaves, visible, infrared, or ultraviolet light.

“Radiation area” means any area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.05 mSv (0.005 rem) in 1 hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

“Radiation machine” means any assemblage of components capable of producing radiation except those devices with radioactive material as the only source of radiation. This assemblage may include, as determined by the Agency:

- (1) Not more than one control panel;
- (2) The necessary supporting structures; and
- (3) Any additional components or auxiliary equipment that function with the assemblage to produce the result desired by using the machine.

“Registrant” means any person who is registered with the Agency and is legally obligated to register with the Agency pursuant to these regulations and Act.

“Registration” means registration with the Agency in accordance with the regulations adopted by the Agency.

“Rem” means the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor (1 rem = 0.01 sievert).

“Restricted area” means an area, access to which is limited by the licensee or registrant for the purpose of protecting individuals against undue risks from exposure to sources of radiation. A restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.

“Roentgen” means the special unit of exposure. One roentgen (R) equals 2.58×10^{-4} coulombs/kilogram of air (see “Exposure”).

“Shallow Dose Equivalent” [See “Dose”]

“SI” means the abbreviation the International System of Units.

“Sievert” means the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sievert is equal to the absorbed dose in gray multiplied by the quality factor (1 sv = 100 rem).

“Survey” means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of sources of radiation. When appropriate,

such evaluation includes, but is not limited to, tests, physical examinations, and measurements of levels of radiation or concentrations of radioactive material present.

“Test” means the process of verifying compliance with an applicable regulation.

“These regulations” means all parts of COMAR 26.12 “Radiation Management”.

“Total effective dose equivalent” [See “Dose”]

“Total organ dose equivalent” [See “Dose”]

“Unrestricted area” means any area, access to which is not limited by the licensee or registrant.

“Week” means 7 consecutive days starting on Sunday.

“Whole Body” means, for purposes of external exposure, head, trunk including male gonads, arms above the elbow, or legs above the knee.

“Worker” means an individual engaged in work under a license or registration issued by the Agency and controlled by a licensee or registrant, but does not include the licensee or registrant.

“Year” means the period of time beginning in January used to determine compliance with the provisions of these regulations. The licensee or registrant may change the starting date of the year used to determine compliance by the licensee or registrant

provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years.

Section A.3 Exemptions

(a) General Provision. The Agency may, upon application or upon its own initiative, grant such exemptions or exceptions from the requirements of these regulations as it determines are authorized by law and will not result in undue hazard to public health and safety or property.

Under certain conditions, the Agency may exempt an x-ray machine or use of an x-ray machine from these regulations.

Section A.4 Records.

(b) Each person responsible for a radiation machine facility shall maintain such records as required by these regulations at the facility where the radiation machine is located or stored.

(c) Each licensee or registrant shall maintain records showing the receipt, inventory, transfer, and disposal of all sources of radiation.

Refer to Appendix A (located at the end of the document)

All records must be kept at the location of radiation machine. (Example: Radiation Machine Facility Registration form (RX1), personnel monitoring records, notice to employee posting, and log of processing solutions changes).

All service reports such as installation reports and disassembly reports must be available.

Section A.5 Inspections.

(a) Each licensee and registrant shall afford the Agency at all reasonable times opportunity to inspect sources of radiation, the premises and facilities wherein such sources of radiation are used or stored.

The Agency may conduct an inspection of your office at any reasonable time. Inspections do not have to be pre-announced if a violation is suspected or determined to exist.

(b) Each licensee and registrant shall make available, upon inspection by the Agency, records maintained pursuant to these regulations.

Section A.6 Tests.

Each licensee and registrant shall perform upon instructions from the Agency, or shall permit the Agency to perform, such reasonable tests as the Agency deems appropriate or necessary including, but not limited to, tests of:

- (a) sources of radiation;
- (b) facilities wherein sources of radiation are used or stored;
- (c) radiation detection and monitoring instruments; and
- (d) other equipment and devices used in connection with utilization for storage of licensed or registered sources of radiation.

Section A.7 Additional Requirements.

The Agency may, by rule, regulation, order, license amendment or registrant condition, impose such requirements upon any licensee/registrant above and beyond those established in these regulations as it deems appropriate or necessary to minimize danger to public health and safety or property.

Section A.8 Violations.

An injunction or other court order may be obtained prohibiting any violation of any provision of the Act or any regulation or order issued thereunder. Any person who willfully violates any provision of the Act or any regulation or order issued thereunder may be guilty of a misdemeanor and, upon conviction, may be punished by fine or imprisonment or both, as provided by

The Agency may perform certain tests to the radiation machine and to the automatic processor or manual tank to ensure the optimum performance.

The Agency may add requirements if necessary to protect public health, safety, and the environment.

The Agency may issue injunctions or orders.

law.

Section A.9 Impounding.

Sources of radiation shall be subject to impounding pursuant to the Act.

The agency may impound your x-ray machine for violating these regulations.

Section A.10 Prohibited Uses.

(c) No person shall possess or store a radiation machine which does not meet the requirements of these regulations or COMAR 26.12.02 unless such radiation machine has been internally rendered inoperable, in a manner approved by the Department, by a service provider registered under COMAR 26.12.01.01B.6

B.6 – refer to COMAR 26.12.01.01.

COMAR 26.12.02 – refers to radiation machines that undergo the certification process.

Have your radiation machine disabled by a registered service company.

Section A.11 Interpretations.

Except as specifically authorized by the Agency in writing, no interpretation of these regulations by an officer or employee of the agency will be recognized to be binding upon the Agency.

The Office of the Attorney General, MDE, must make official interpretations of these regulations.

Section A.12 Communications.

All communications and reports concerning these regulations, and applications filed thereunder, should be addressed to the Agency at its office located at 1800 Washington Highway, Baltimore, MD 21230.

Mail correspondence to:
Maryland Department of the Environment
Radiological Health Program
1800 Washington Blvd.
Baltimore, MD 21230
Phone number: (410) 537-3300 or within MD
call 1-800-633-6101



The text on the left side of the page of the page is an unofficial version of the official rule found in COMAR 26.12.01.01

The language on the right side of the page addresses issues of compliance with the rules

Section A.13 Units of Exposure and Dose.

(a) As used in these regulations, the unit of Exposure is the coulomb per kilogram (c/kg). One roentgen is equal to 2.5×10^{-4} coulomb per Kilogram of air.

(b) As used in these regulations, the units of dose are:

Gray (Gy) is the SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (100 rad).

Rad is the special unit of absorbed dose. One rad is equal to an absorbed dose of 100 erg per gram or 0.01 joule per kilogram (0.01 Gy).

Rem is the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor (1 rem = 0.01 Sv).

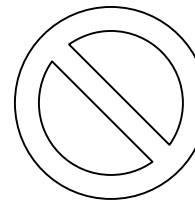
Sievert is the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sievert is equal to the absorbed dose in gray multiplied by the quality factor (1 Sv = 100rem).

Section A.15 False Statements, Representations and Certifications.

No person shall:

(a) No person make a false statement, representation, or certification in any application, record, report, plan or other

Giving the agency false information is forbidden.



The text on the left side of the page of the page is an unofficial version of the official rule found in COMAR 26.12.01.01

document regarding radiation levels, tests performed, radiation safety conditions practices or notices, or

(b) falsify, tamper with or render inaccurate any monitoring device or method for data collection if the data collected by that device or method is required by these regulations, or by any license or registration condition.

Section B.2 Definitions.

“Facility” means the location at which one or more devices or sources are installed and/or located within one building, vehicle, or under one roof and are under the same administrative control.

“Storage” means a condition in which a device or source is not being used for an extended period of time, and has been made inoperable by a person registered under Section B.6 of this Part.

Section B.3 Exemptions.

(a) Electronic equipment that produces radiation incidental to its operation for other purposes is exempt from the registration and notifications requirements of this Part, provided that the dose equivalent rate averaged over an area of 10 square centimeters does not exceed 5 μSv (0.5 millirem) per hour at 5 centimeters from any accessible surface of such equipment. The production, testing, or factory servicing of such equipment shall not be exempt.

(b) Radiation machines while in transit or storage incident thereto are exempt from the requirements of this Part.

The definitions are self-explanatory.

These regulations do not apply to certain electronic equipment such as televisions.

If you notified the agency in writing and provide documentation

- (c) Domestic television receivers are exempt from the requirements of this Part.

Section B.5 Registration of Radiation Machine Facilities.

Each person having a radiation machine facility shall:

- (a) Apply for registration of such facility with the Agency prior to the completion of the installation of a radiation machine in the facility. Application for registration shall be completed on forms furnished by the Agency and shall contain all the information required by the form and accompanying instructions.
- (b) Designate on the application form an individual to be responsible for radiation protection.
- (c) Prohibit any person from furnishing radiation machine servicing or services as described in B.6(d) to his radiation machine facility until such person provides evidence that he has been registered with the Agency as a provider of services in accordance with B.6.

Section B.7 Issuance of Notice of Registration.

- (a) Upon a determination that an applicant meets the requirements of the regulations, the Agency shall issue a notice of registration.
- (b) The Agency may incorporate in the notice of registration at the time of issuance or thereafter by appropriate rule,

The text on the left side of the page of the page is an unofficial version of the official rule found in COMAR 26.12.01.01

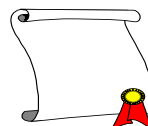
such as a removal report from a registered service provider that all of your x-ray machines are in storage, these regulations do not apply to you. But, if you have a service provider energize an x-ray machine in storage, the rules apply.

Send the Radiation Machine Facility Registration Form (RX1), installation reports, and the annual fee **before** the radiation machine is completely installed.



You must name an individual who is responsible for the radiation machine.

Refer to Appendix B (located at the end of the document)
Registrants may only use registered service providers to work on the radiation machine.
B.6 – refer to COMAR 26.12.01.01.



A certificate of registration will be issued if the application is complete, meets all the requirements, and the fee is paid.

The agency may add conditions to your registration if necessary

regulation, or order, such additional requirements and conditions with respect to the registrant's receipt, possession, use, transfer, or servicing of radiation machines as it deems appropriate or necessary.

Section B.8 Expiration of Notice of Registration.

Except as provided by B.9(b), each notice of registration shall expire at the end of the specified day in the month and year stated therein.

Section B.9 Renewal of Notice of Registration.

- (a) Application for renewal of registration shall be filed in accordance with B.5 or B.6.
- (b) In any case in which a registrant has filed an application, not less than 14 days prior to the expiration of his existing notice of registration, in proper form for renewal, such existing notice of registration shall not expire until the application status has been finally determined by the Agency.

Section B.10 Report of Changes.

The registrant shall notify the Agency in writing before making any change which would render the information contained in the application for registration and/or the notice of registration no longer accurate.

to protect occupational and public health. The Agency will notify you of any conditions it deems necessary.

The certificate of registration expires every two years on the last day of the month the facility was registered.

B.6 refer to COMAR 26.12.01.01.

The Agency will send you a Radiation Machine Registration Form (RX1) and an invoice a month prior to reregistering. You must complete the Radiation Machine Registration Form (RX1) and submit fees in order for your registration to be renewed.

Refer to Appendix C (located at the end of the document)

If you decide to relocate, or ownership has changed, or terminate your registration the following must be done:

- You must inform the agency in writing and submit appropriate documentation such as:

- submit installation reports
- submit disassembly reports
- submit bill of sale that shows ownership has changed
- pay any outstanding fees



The text on the left side of the page of the page is an unofficial version of the official rule found in COMAR 26.12.01.01

18

The language on the right side of the page addresses issues of compliance with the rules

Section B.11 Approval Not Implied.

No person, in any advertisement, shall refer to the fact that he or his facility is registered with the Agency pursuant to the provisions of B.5 or B.6, and no person shall state or imply that any activity under such registration has been approved by the Agency.

You cannot advertise you are registered.
B.6 refer to COMAR 26.12.01.01.

Section B.13 Out-of-State Radiation Machine.

(a) Whenever any radiation machine is to be brought into the State, for any temporary use, the person proposing to bring such machine into the State shall give written notice to the Agency at least 3 working days before such machine is to be used in the State.

This applies only to dental machines brought in to Maryland from out-of-state for temporary use.
An out-of-state radiation machine must be registered and inspected.
All regulations apply to this radiation machine.

The notice shall include:

- (i) The type of radiation machine;
- (ii) The nature, duration, and scope of use;
- (iii) The exact location (s) where the radiation machine is to be used; and
- (iv) The State of Maryland facility registration number, the State machine number and the date last certified.

(b) If, for the specific case, the three-day period would impose an undue hardship on the person, upon application to the Agency, permission to proceed sooner may be granted.

- (c) The person referred to in B.13(a) shall:
- (i) Comply with all applicable regulations of the Agency;

- (ii) Supply the Agency with such other information as the Agency may reasonable request; and
- (iii) Not operate within the State on a temporary basis in excess of 180 calendar days per year.

Section D.3 Definitions. As Used in Part D.

“Declared pregnant woman” means a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception.

“Dosimetry processor” means a person that processes and evaluates individual monitoring devices in order to determine the radiation dose delivered to the monitoring devices.

“Nonstochastic effect” means a health effect, the severity of which varies with the dose and for which a threshold is believed to exist. Radiation-induced cataract formation is an example of a nonstochastic effect. For purpose of these regulations, “deterministic effect” is an equivalent term.

“Quarter” means a period of time equal to one-fourth of the year observed by the licensee, approximately 13 consecutive weeks, providing that the beginning of the first quarter in a year coincides with the starting date of the year and that no day is omitted or duplicated in consecutive quarters.

“Stochastic effect” means a health effect that occurs randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a linear function of dose without threshold. Hereditary effects and cancer incidence are examples

The definitions are self-explanatory.

of stochastic effects. For purpose of these regulations, “probabilistic effect” is an equivalent term.

Section D.101 Radiation Protection Programs.

(a) In addition to complying with all other provisions of these regulations, a licensee or registrant shall use all means to maintain radiation exposures and releases of radioactive material as low as is reasonable achievable (ALARA).

You must maintain radiation exposures as low as reasonably achievable (ALARA).

Section D.201 Occupational Dose Limits for Adults.

(a) The licensee or registrant shall control the occupational dose to individual adults, except for planned special exposures pursuant to D.206, to the following dose limits:

D.206 – refer to COMAR 26.12.01.01.

There are annual radiation dose limits for workers, pregnant women, and the public.

(i) An annual limit, which is the more limiting of:

5,000 millirem for workers

(1) The total effective dose equivalent being equal to 0.05 Sv (5 rem); or

500 millirem in 9 months for pregnant women

100 millirem to the general public

(2) The sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 0.5 Sv (50 rem).

(ii) The annual limits to the lens of the eye, to the skin, and to the extremities which are:

(1) An eye dose equivalent of 0.15 Sv (15 rem), and

15,000 millirem for the lens of the eye

(2) A shallow dose equivalent of 0.50 Sv (50 rem) to the skin or to any extremity.

50,000 millirem for the skin and extremity

(b) Doses received in excess of the annual limits, including doses received during accidents, emergencies, and planned special exposures, shall be subtracted from the limits for planned special exposures that the individual may receive during the current year and during the individual's lifetime. See D.206e.i and ii.

D.206e.i and ii – refer to COMAR 26.12.01.01.

(c) The assigned deep dose equivalent and shallow dose equivalent shall be for the portion of the body receiving the highest exposure. Such dose shall be determined as follows:

(i) The deep dose equivalent, eye dose equivalent and shallow dose equivalent may be assessed from surveys or other radiation measurements for the purpose of demonstrating compliance with the occupational dose limits, if the individual monitoring device was not in the region of highest potential exposures, or the results of individual monitoring are unavailable; or

The Agency interprets the dose received by the collar badge to represent the dose received by the individual assigned to the badge.

(ii) The dose equivalent as computed by formula or methodology specifically approved the Agency.

Other methods for calculating dose are pre-approved by the Agency on a case by case basis.

(f) The licensee or registrant shall reduce the dose that an individual may be allowed to receive in the current year by the amount of occupational dose received while employed by any other person. See D.205e.

D.205e refer to COMAR 26.12.01.01.

Section D.207 Occupational Dose Limits for Minors.

The annual occupational dose limits for minors are 10 percent of the annual occupational dose limits specified for adult workers in D.201.

Section D.208 Dose to an Embryo/Fetus.

- a. The licensee or registrant shall ensure that the dose to an embryo/fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed 5mSv (0.5 rem). See D.1107 for record keeping requirements.
- b. The licensee or registrant shall make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman so as to satisfy the limit in D.208a.
- c. The dose to an embryo/fetus shall be taken as the sum of:
 - (i) The deep dose equivalent to the declared pregnant woman; and
 - (ii) The dose to the embryo/fetus from radionuclides in the embryo/fetus and radionuclides in the declared pregnant woman.
- d. If by the time the woman declares pregnancy to the licensee or registrant, the dose to the embryo/fetus has exceeded 4.5 mSv (0.45 rem), the licensee or registrant shall be deemed to be in compliance with D.208a, if the additional dose to the embryo/fetus does not exceed 0.5mSv (0.05 rem) during the remainder of the pregnancy.

Annual dose is 500 millirem for any individual under 18 years old

For 9 months the dose is 500 millirem for a pregnant women.
Should not exceed more than 50 millirem per month.

Section D.301 Dose Limits for Individual Members of the Public.

a. Each licensee or registrant shall conduct operations so that:

i. The total effective dose equivalent to individual members of the public from the licensed or registered operation does not exceed 1 mSv (0.1 rem) in a year, exclusive of the dose contribution from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with G.25, from voluntary participation in medical research programs, and the licensee's or registrant's disposal of radioactive material into sanitary sewerage in accordance with D.1003, and

ii. The dose in any unrestricted area from external sources does not exceed 0.02 mSv (0.002 rem) in any one hour.

b. The Agency may impose additional restrictions on radiation levels in unrestricted areas and on the total quantity of radionuclides that a licensee may release in effluents in order to restrict the collective dose.

c. If the licensee or registrant permits members of the public to have access to restricted areas, the limits for members of the public continue to apply to those individuals.

Section D.501 General.

c. All personnel dosimeters, except for direct and indirect

Facilities must insure and /or demonstrate that dose from the radiation machines will not expose the general public to more than 100 millirem per year.

G. 25 and D.1003 – refer to COMAR 26.12.01.01.

Facilities must also insure and/or demonstrate that dose from the radiation machines will not expose the general public to more than 2 millirem per hour.

You must send your personnel monitoring back to the accredited

reading pocket ionization chambers and those dosimeters used to measure the dose to any extremity, that require processing to determine the radiation dose and that are used by licensees and registrants to comply with D.201, with other applicable provisions of these regulations, or with conditions specified in a license or registration shall be processed and evaluated by a dosimetry processor:

- i. Holding current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology; and
- ii. Approved in this accreditation process for the type of radiation or radiations included in the NVLAP program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored.

- d. Exposure of a personnel monitoring device to deceptively indicate a dose delivered to an individual is prohibited

Section D.502 Conditions Requiring Individual Monitoring of External and Internal Occupational Dose.

Each licensee or registrant shall monitor exposures from sources of radiation at levels sufficient to demonstrate compliance with the occupational dose limits of Part D. As a minimum:

- a. Each licensee or registrant shall monitor occupational exposure to radiation and shall supply and require the use of

film badge supplier for a dose reading.

An investigation by the Agency will be initiated to determine the root cause.

Personnel monitoring is required for all dental facilities in order to exhibit that it is not possible to exceed 10 percent of the legal limits.

If badges are turned in monthly – monitor for 6 months consecutively.

If badges are turned in quarterly – monitor for 1 year

individual monitoring devices by:

- i. Adults who potentially may receive, in 1 year, from sources external to the body, a dose in excess of 10 percent of the limits in D.201a.;
- ii. Minors and declared pregnant women who potentially may receive, in 1 year from sources external to the body, a dose in excess of 10 percent of any of the applicable limits in D.207 or D.208;

consecutively.

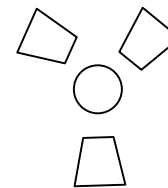
Section D.901 Caution Signs.

- a. **Standard Radiation Symbol.** Unless otherwise authorized by the Agency, the symbol prescribed by D.901 shall use the colors magenta, or purple, or black on yellow background. The symbol prescribed is the three-bladed design as follows:

This is the radiation symbol:

Radiation Symbol

- i. Cross-hatched area is to be magenta, or purple, or black, and
- ii. The background is to be yellow.



- b. Exception to Color Requirement for Standard Radiation Symbol. Notwithstanding the requirements of D.901a., licensees or registrants are authorized to label sources, source holders, or device components containing sources

Exception to using only magenta and yellow are allowed.

of radiation that are subjected to high temperatures, with conspicuously etched or stamped radiation caution symbols and without a color requirement.

- c. Additional Information on Signs and Labels. In addition to the contents of signs and labels prescribed in Part D, the licensee or registrant shall provide, on or near the required signs and labels, additional information, as appropriate to make individuals aware of potential radiation exposures and to minimize the exposures.

Section D.1107 Records of Individual Monitoring Results.

- a. Recording Requirement. Each licensee or registrant shall maintain records of doses received by all individuals for whom monitoring was required pursuant to D.502, and records of doses received during planned special exposures, accidents, and emergency conditions. Assessments of dose equivalent and records made using units in effect before October 9, 1995 need not be changed. These records shall include, when applicable:

- i. The deep dose equivalent to the whole body, eye dose equivalent, shallow dose equivalent to the skin, and shallow dose equivalent to the extremities;

- d. The licensee or registrant shall maintain the records of dose to an embryo/fetus with the records of dose to the declared pregnant woman. The declaration of pregnancy, including the estimated date of conception, shall also be kept on file, but may be maintained separately from the dose records.

You may use more posting than required.

You must maintain all dosimetry badge reports supplied by the film badge supplier at the facility at all times for review as proof of minimal radiation exposure.

e. The licensee or registrant shall retain each required form or records until the Agency terminates each pertinent license or registration requiring the record, or for such time as the Agency shall determine.

Section D.1201 Reports of Stolen, Lost, or Missing Licensed or Registered Sources of Radiation.

a. Immediate Report. Each licensee or registrant shall report by telephone immediately and in writing within 24 hours to the Agency the theft or loss of any source of radiation immediately after such occurrence becomes known.

b. Following Report. Each licensee or registrant required to make a report pursuant to D.1201a. shall, within 30 days after making the telephone report, make a written report to the Agency setting forth the following information;

- i. A description of the licensed or registered source of radiation involved, including for radioactive material, the kind, quantity, and chemical and physical form, and, for radiation machine, the manufacturer, model and serial number, type and maximum energy of radiation emitted; and
- ii. A description of the circumstances under which the loss or theft occurred; and
- iii. A statement of disposition, or probable disposition, of the licensed or registered source of radiation involved; and

All records must be kept until the Agency notifies the facility that the registration has been cancelled.

If your x-ray machine is lost or stolen, you must notify the Agency immediately by telephone (410-537-3300) and notify the Agency within 24 hours in writing.

Within 30 days from your telephone call, send the agency a written report that includes these details:

- manufacturers name, model, serial number
- how the machine was lost or stolen
- what happened to the machine
- what you have done to prevent it from happening again

- iv. Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas; and
- v. Actions that have been taken, or will be taken, to recover the source of radiation; and
- vi. Procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss or theft of licensed or registered sources of radiation.

c. Subsequent to filing the written report required in D.1201(b), the licensee or registrant shall also report additional substantive information on the loss or theft within 30 days after the licensee or registrant learns of such information.

d. The licensee or registrant shall prepare any report filed with the Agency pursuant to D.1201 so that names of individuals who may have received exposure to radiation are stated in a separate and detachable portion of the report.

Section F.2 Definitions. As used in this part, the following definitions apply:

“Added Filtration” means any filtration which is in addition to the inherent filtration. The definitions are self-explanatory.

“Aluminum equivalent” means the thickness of type 1100

aluminum alloy 1/affording the same attenuation, under specified conditions, as the material in question.

1/ The nominal chemical composition of type 1100 aluminum alloy is 99.00 percent minimum aluminum, 0.12 percent copper.

“Assembler” means any person engaged in the business of assembling, replacing, or installing one or more components into an x-ray system or subsystem. The term includes the owner of an x-ray system or his or her employee or agent who assembles components into an x-ray system that is subsequently used to provide professional or commercial services

“Barrier” (See “Protective barrier”).

“Beam axis” means a line from the source through the centers of the x-ray fields.

“Beam-limiting device” means a device which provides a means to restrict the dimensions of the x-ray field.

“Cephalometric device” means a device intended for the radiographic visualization and measurement of the dimensions of the human head.

“Certified components” means components of x-ray systems which are subject to regulations promulgated under Public Law 90-602, the Radiation Control for Health and Safety Act of 1968.

“Certified system” means any x-ray system which has one or more certified component(s).

“Coefficient of variation” or “C” means the ratio of the standard deviation to the mean value of a population of observations. It is estimated using the following equation:

$$C = \frac{s}{\bar{x}} = \frac{1}{\bar{x}} \left[\sum_{i=1}^n \frac{(x_i - \bar{x})^2}{n-1} \right]^{1/2}$$

“Control panel” means that part of the x-ray control upon which are mounted the switches, knobs, pushbuttons, and other hardware necessary for manually setting the technique factors.

“Cooling curve” means the graphical relationship between heat units stored and cooling time.

“Diagnostic source assembly” means the tube housing assembly with a beam-limiting device attached.

“Diagnostic x-ray system” means an x-ray system designed for irradiation of any part of the human body for the purpose of diagnosis or visualization.

“Entrance exposure rate” means the exposure per unit time at the point where the center of the useful beam enters the patient.

“Equipment” (See “X-ray equipment”)

“Field emission equipment” means equipment which uses an x-ray tube in which electron emission from the cathode is due solely to the action of an electric field.

“Filter” means material placed in the useful beam to absorb preferentially selected radiations.

“Focal spot” means the area projected on the anode of the x-ray tube by the electrons accelerated from the cathode and from which the useful beam originates.

“Gonad shield” means a protective barrier for the testes or ovaries.

“Half-value layer” means the thickness of specified material which attenuates the beam of radiation to an extent such that the exposure rate is reduced to one-half of its original value. In this definition, the contribution of all scattered radiation, other than any which might be present initially in the beam concerned, is deemed to be excluded.

“Heat unit” means a unit of energy equal to the product of the peak kilovoltage, milliamperes, and seconds, i.e., $\text{kVp} \times \text{mA} \times \text{second}$.

“HVL” (See “Half-value layer”)

“Image receptor” means any device, such as a fluorescent screen or radiographic film, which transforms incident x-ray photons either into a visible image or into another form which can be made into a visible image by further transformations.

“Inherent filtration” means the filtration of the useful beam provided by the permanently installed components of the tube housing assembly.

“Kilovolts peak” (See “Peak tube potential”).

“kV” means kilovolts.

“kVp” (See “Peak tube potential”)

“Lead equivalent” means the thickness of lead affording the same attenuation, under specified conditions, as the material in question.

“Leakage radiation” means radiation emanating from the diagnostic or therapeutic source assembly except for:

- (1) the useful beam, and
- (2) radiation produced when the exposure switch or timer is not activated.

“mA” means milliamperes.

“mAs” means milliamperes second.

“Mobile x-ray equipment” (See “X-ray equipment”).

“Patient” means an individual subjected to healing arts examination, diagnosis, or treatment.

“Peak tube potential” means the maximum value of the potential difference across the x-ray tube during an exposure.

“PID” (See Position indicating device”).

“Position indicating device” means a device on dental x-ray equipment used to indicate the beam position and to establish a definite source-surface (skin) distance. It may or may not incorporate or serve as a beam-limiting device.

“Protective apron” means an apron made of radiation absorbing materials used to reduce radiation exposure.

“Protective barrier” means a barrier of radiation absorbing material(s) used to reduce radiation exposure. The types of protective barriers are as follows:

- (1) “Primary protective barrier” means the material, excluding filters, placed in the useful beam, for protection purposes, to reduce the radiation exposure.
- (2) “Secondary protective barrier” means a barrier sufficient to attenuate the stray radiation to the required degree.

“Qualified expert” means an individual who has demonstrated to the satisfaction of the Agency that such individual possesses the knowledge and training to measure ionizing radiation, to evaluate safety techniques, and to advise regarding radiation protection needs.

“Radiograph” means an image receptor on which the image is created directly or indirectly by an x-ray pattern and results in a permanent record.

“Radiographic imaging system” means any system whereby a permanent or semi-permanent image is recorded on an image receptor by the action of ionizing radiation.

“Rating” means the operating limits as specified by the component manufacturer.

“Recording” means producing a permanent form of an image resulting from x-ray photons.

“Scattered radiation” means radiation that, during passage through matter, has been deviated in direction (See “Direct scattered radiation”).

“Secondary protective barrier” (See “Protective barrier”).

“SID” (see “Source-image receptor distance”).

“Source” means the focal spot of the x-ray tube.

“Source-image receptor distance” means the distance from the source to the center of the input surface of the image receptor.

“SSD” means the distance between the source and the skin of the patient.

“Stationary x-ray equipment” (See “X-ray equipment”).

“Stray radiation” means the sum of leakage and scattered radiation.

“Technique factors” means the following conditions of operation:

(5) For all other equipment, peak tube potential in kV, and either tube current in mA and exposure time in seconds, or the product of tube current and exposure time in mAs.

“Termination of irradiation” means the stopping of irradiation in a fashion which will not permit continuance of irradiation without the resetting of operating conditions at the control panel.

“Traceable to a national standard” means that a quantity or a measurement has been compared to a national standard directly or indirectly through one or more intermediate steps and that all comparisons have been documented.

“Tube” means an x-ray tube, unless otherwise specified.

“Tube housing assembly” means the tube housing with tube installed. It includes high-voltage and/or filament transformers and other appropriate elements when such are contained within the tube housing.

“Tube rating chart” means the set of curves which specify the rated limits of operating of the tube in terms of the technique factors.

“Useful beam” means the radiation emanating from the tube housing port or the radiation head and passing through the aperture of the beam limiting device when the exposure controls are in a mode to cause the system to produce radiation.

“X-ray control” means a device which controls input power to the x-ray high-voltage generator and/or the x-ray tube. It includes equipment such as timers, phototimers, automatic brightness stabilizers, and similar devices, which control the technique factors of an x-ray exposure.

“X-ray equipment” means an x-ray system, subsystem, or component thereof. Types of x-ray equipment are as follows:

- (1) “Mobile x-ray equipment” means x-ray equipment mounted on a permanent base with wheels and/or casters for moving while completely assembled.
- (2) “Portable x-ray equipment” means x-ray equipment designed to be hand-carried.
- (3) “Stationary x-ray equipment” means x-ray equipment which is installed in a fixed location, and includes x-ray equipment permanently installed in a vehicle.

“X-ray field” means that area of the intersection of the useful beam and any one of the set of planes parallel to and including the plane of the image receptor, whose perimeter is the locus of points at which the exposure rate is one-fourth of the maximum in the intersection.

“X-ray high-voltage generator” means a device which transforms electrical energy from the potential supplied by the x-ray control to the tube operating potential. The device may also include means for transforming alternating current to direct current,

filament transformers for the x-ray tube(s), high voltage switches, electrical protective devices, and other appropriate elements.

“X-ray subsystem” means any combination of two or more components of an x-ray system.

“X-ray system” means an assemblage of components for the controlled production of x rays. It includes minimally an x-ray high voltage generator, an x-ray control, a tube housing assembly, a beam-limiting device, and the necessary supporting structures. Additional components which function with the system are considered integral parts of the system.

“X-ray tube” means any electron tube which is designed to be used primarily for the production of x rays.

Section F.3 General Requirements.

(a) Administrative Controls.

(1) Registrant. The registrant shall be responsible for directing the operation of the x-ray system(s) under his administrative control. The registrant or the registrant’s agent shall assure that the requirements of these regulations are met in the operation of the x-ray system(s).

You are responsible for the operation of your radiation machine.

- (i) An x-ray system which does not meet the provisions of these regulations shall not be operated for diagnostic or therapeutic purposes.

If your radiation machine does not meet the requirements set forth in these regulations, you may not use the machine.

- | | |
|--|--|
| <p>(ii) Individuals who will be operating the x-ray systems shall be adequately instructed in the safe operating procedures and be competent in the safe use of the equipment.</p> | <p>The operators must be registered or licensed through the Department of Health and Mental Hygiene.</p> |
| <p>(iii) A chart shall be provided in the vicinity of the diagnostic x-ray system's control panel which specifies, for all examinations performed with that system, the following information:</p> <ul style="list-style-type: none"> (a) patient's body part and anatomical size or body part thickness, or age (for pediatrics) versus technique factors to be utilized; (b) type and size of the film or film-screen combination to be used; (c) type and focal distance of the grid to be used, if any; (d) source to image receptor distance to be used; (e) type and location of placement of patient shielding (e.g., gonad, etc.) to be used; and | <p>You must have a technique chart for each x-ray machine and follow that chart. This is required for cephalometric machines and the newer panoramic machines.</p> |
| <p>(iv) Written safety procedures shall be provided to each individual operating x-ray</p> | |

equipment, including any restrictions of the operating technique required for the safe operation of the particular x-ray system. The operator shall be able to demonstrate familiarity with these procedures.

- (v) Except for patients who cannot be moved out of the room, only the staff and ancillary personnel required for the medical procedure or training shall be in the room during the radiographic exposure. Other than the patient being examined:

- (a) All individuals shall be positioned such that no part of the body will be struck by the useful beam unless protected by no less than 0.5 millimeter lead equivalent.

- (b) All persons shall be protected from the direct scatter radiation by protective aprons or whole body protective barriers of not less than 0.25 millimeter lead equivalent.

- (c) Patients who cannot be removed from the room shall be protected from the direct scatter radiation by whole body protective barriers of not less than 0.25 millimeter lead equivalent or shall be so positioned that the nearest portion of

Lead aprons should be used on patients to protect them from scatter radiation.

the body is at least 2 meters from both the tube head and the nearest edge of the image receptor.

- (vi) Gonad shielding of not less than 0.5 millimeter lead equivalent shall be used for patients, who have not passed the reproductive age, during radiographic procedures in which the gonads are in the useful beam, except for case in which this would interfere with the diagnostic procedure.

- (vii) Individuals shall not be exposed to the useful beam except for healing arts purposes and unless such exposure has been authorized by a licensed practitioner of the healing arts. This provision also prohibits deliberate exposure of the purpose of training, demonstration, or other non-healing-arts purposes.

- (ix) Procedures and auxiliary equipment designed to minimize patient and personnel exposure commensurate with the needed diagnostic information shall be utilized. Such procedures and equipment shall include, but are not limited to the following:

- (a) The speed of film or screen and film combinations shall be the

Only qualified users may operate the x-ray machine.

Minimum dose to the patient is achieved not only by the radiation machine working according to manufactures specification but:

Ensuring that darkrooms are properly maintained.

fastest speed consistent with the diagnostic objective of the examinations;

- (b) The radiation exposure to the patient shall be the minimum exposure required to produce images of good diagnostic quality;
- (c) Portable or mobile x-ray equipment shall be used only for examinations where it is impractical to transfer the patient(s) to a stationary x-ray installation; or
- (d) X-ray systems subject to F.6 shall not be utilized in procedures where the source to patient distance is less than 30 centimeters.

The timer should be set as low as possible.

(b) Processing of film.

- (1) All film shall be processed in such a fashion as to achieve adequate sensitometric performance. "Adequate sensitometric performance" means:
 - (i) measure processing speed of greater than or equal to 80; and

Tests are used to determine the processing of the film and the amount of the light in the darkroom.

- (ii) That the base plus fog of the facility's film shall not exceed 0.3 OD; as measured by the Sensitometric Technique for the Evaluation of Processing (STEP) test 1/.

1/This test is described by Suleiman, O.H. et al. in the article "Automatic Film Processing: Analysis of 9 Years of Observations." Radiology 1992 Vol. 185, pp. 25-28.

(2) Manual Processing of Film.

- (i) Where film is developed manually, a system shall be available which consists of at least one three-sectional tank made of mechanically rigid, corrosion resistant material (each section of which shall be constructed so as to retain its solution separate from the other two) and has the overall temperature controlling capability of maintaining each solution such that the temperature of each solution will always fall within the range of 60°F to 80°F (16-27° C).

The manual tank must be divided into at least three sections – developer, water, and fixer. Also a controlled temperature must be maintained in the manual tank.

- (ii) Devices shall be available which will:
 - (a) Give the actual temperature of the developer, plus or minus

A thermometer and a timer must be used for manual processing.

2° F (or 1° C if SI units are used), and

- (b) Give an audible or visible signal after a preset time, plus or minus 10% of the preset time.

(3) Chemical-Film Processing Control.

- (i) Chemicals shall be mixed in accord with the chemical manufacturer's recommendations.
- (ii) Replenishing of chemicals shall be sufficient to maintain the standards of (b)(1) above.
- (iii) All processing chemicals shall be completely replaced at least every 3 months.

Follow the manufacturer's instructions for mixing chemicals.

Chemical must be changed a minimum of every 3 months and as often as required to maintain optimum processing. (This is dependent on the workload of the facility)

- (4) Automatic Processors and Other Closed Processing Systems. Preventative maintenance shall be performed on the unit, except for extended periods of non-use, on a frequency basis which is not less than that schedule recommended by the manufacturer. In the even that no schedule is available from the manufacturer, a maintenance schedule shall be established which will preserve good film quality.

Keep a record of when you changed chemicals, cleaned your processor, and made any repairs to the processor. Automatic daily replenishment of chemicals does not need to be denoted.

(5) Film Fog Prevention

- (i) Film processing areas and devices shall be constructed so that film being processed, handled, or stored will be exposed only to light which has passed through a proper safelight filter.
- (ii) That light which remains in a film processing area or device following compliance with F.3(b)(5)(i) shall, when exposed to film in a two minute fog test, produce an increase in fog of not more than 0.05 density units.
- (iii) In determining compliance with F.3(b)(5)(ii), fog measurements are to be made at exposed film densities of 1.0 plus base plus fog.

Your darkroom must not have any extraneous light leakage except for light from the proper safelight (for example: GBX 2 or equivalent).

(c) Quality Assurance.

The registrant shall be responsible for establishing and operating an effective program for radiographic imaging quality control. This program shall be designed to fulfill the following goals:

Poor processing contributes to a low quality radiographic film so a quality assurance program must be established to obtain the highest quality of diagnostic imaging and ensures low radiation to the patients. (example: step wedge, time-temperature chart, etc)

- (1) That the diagnostic quality of radiographic images will be maintained at the highest level;
- (2) That film processing systems will be maintained at the highest quality level;
- (3) That radiographic images will be produced using the minimum radiation doses to patients;

- and
- (4) That the above three goals will be consistently met.

Section F.4 General Requirements for All Diagnostic X-ray Systems. In addition to other requirements of this part, all diagnostic x-ray systems shall meet the following requirements:

(a) Warning Label. The control panel containing the main power switch shall bear the warning statement, legible and accessible to view: “WARNING: This x-ray unit may be dangerous to patient and operator unless safe exposure factors and operating instructions are observed.”

(e) Beam Quality.

(1) Half-Value Layer.

- (i) The half-value layer of the useful beam for a given x-ray tube potential shall not be less than the values shown in Table I. If it is necessary to determine such half-value layer at an x-ray tube potential which is not listed in Table I, linear interpolation or extrapolation may be made.

The x-ray beam must be filtered. Most dental x-ray machines are manufactured with the correct filters.

Table I		
Design operating range (kVp)	Measured potential (kVp)	Half-value layer (mm of aluminum)
Below 50	30	0.3
	40	0.4
	49	0.5
50 to 70	50	1.2
	60	1.3
	70	1.5
Above 70	71	2.1
	80	2.3
	90	2.5
	100	2.7
	110	3.0
	120	3.2
	130	3.5
	140	3.8
	150	4.1

- (ii) In addition to the requirements of F.4(e)(1)(i), all intraoral dental radiographic systems manufactured on and after December 1, 1980, shall have a minimum half-value layer not less than 1.5 millimeters aluminum equivalent filtration permanently installed in the useful beam.

(f) Multiple Tubes. Where two or more radiographic tubes are controlled by one exposure switch, the tube or tubes which have been selected shall be clearly indicated prior to initiation of the exposure. This indication shall be both on the x-ray control panel and at or near the tube housing assembly which has been selected. Non-certified equipment is exempt from this requirement.

(g) Mechanical Support of Tube Head. The tube housing assembly supports shall be adjusted such that the tube housing assembly will remain stable during an exposure unless tube housing movement is a designed function of the x-ray systems.

(h) Technique Indicators.

(1) The technique factors to be used during an exposure shall be indicated before the exposure begins. If automatic exposure controls are used, the technique factors which are set prior to the exposure shall be indicated.

(2) The requirement of F4(h)(1) may be met by permanent markings on equipment having fixed technique factors. Indication of technique factors shall be visible from the operator's position except in the case of spot films made by fluoroscopist.

If your x-ray machine has more than one tube head, the control panel and the tube head must show which tube head is being used except for non-certified equipment.

The x-ray machine tube head shall be stable. Do not hold the tube head during the exposure.

The technique factors shall be posted prior to making an exposure.

Section F.6 Radiographic Systems Other Than Fluoroscopic, Dental Intraoral, Veterinarian, or Computed Tomography X-ray Systems.

(a) Beam Limitation. The useful beam shall be limited to the area of clinical interest.

(3) X-ray Systems Designed for One Image Receptor Size. Radiographic equipment designed for only one image receptor size at a fixed SID shall be provided with means to limit the field at the plane of the image receptor to dimensions no greater than those of the image receptor, and to align the center of the x-ray field with the center of the image receptor to within 2 percent of the SID, or shall be provided with means to both size and align the x-ray field such that the x-ray field at the plane of the image receptor does not extend beyond any edge of the image receptor.

(5) X-ray Systems Other Than Those Described in F.6(a)(1),(2),(3), and (4).

- (i) Means shall be provided to limit the x-ray field in the plane of the image receptor so that such field does not exceed each dimension of the image receptor by more than 2 percent of the SID when the axis of the x-ray beam is perpendicular to the plane of the image receptor. Podiatry units with a circular beam are exempted from the 2% limit

These regulations apply to panoramic and cephalometric radiation machines.

The x-ray field must be contained within the borders of the image receptor.

provided the diameter of the x-ray field shall not exceed the diagonal dimension of the image receptor.

- (ii) Means shall be provided to align the center of the x-ray field with the center of the image receptor to within 2 percent of the SID, or means shall be provided to both size and align the x-ray field such that the x-ray field at the plane of the image receptor does not extend beyond any edge of the image receptor.

(6) Source to Image Distance

Except for certified systems, a method shall be provided to indicate the SID to within 2 inches.

(b) Radiation Exposure Control Devices.

(1) Timers.

- (i) Means shall be provided to terminate the exposure at a preset time interval, preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. Such means shall provide that the resulting time interval product of current and time, number of pulses or radiation exposures is accurate to within ten percent of the true

The x-ray timer must be accurate and shall stop x-ray production at a preset time.

- value.
- (ii) It shall not be possible to make an exposure when the timer is set to a “zero” or “off” position if either position is provided.

(2) X-ray Control.

- (ii) Each x-ray control shall be located in such a way as to meet the following requirements:

- (a) Stationary x-ray systems shall be required to have the x-ray control permanently mounted in a protected area so that the operator is required to remain in that protected area during the entire exposure; and
- (b) Means shall be provided so that the operator can view the patient during the exposure.
- (d) The x-ray control shall provide visual indication observable at or from the operator’s protected position whenever x-rays are produced. In addition, a signal audible to the operator shall indicate that the exposure has terminated.

Stand at least 6 feet from the x-ray beam or behind a barrier. You must still be able to view the patient throughout the entire exposure.

A signal audible to the operation shall be exempted if the x-ray machine is manufactured before 1978.

(iii) ACCURACY. Except for certified systems, means shall be provided to terminate an exposure at a preset time interval, preset product of current and time, or preset number of pulses. Such means shall produce a time interval, product of current and time, or number of pulses within 10 percent of the indicated preset value.

(4) Reproducibility. With a timer setting of 0.5 seconds or less, the average exposure period (T) shall be greater than or equal to 5 times the maximum exposure period (Tmax) minus the minimum exposure period (Tmin) when 4 timer tests are performed:

$$T \geq 5 (T_{\max} - T_{\min}).$$

(d) Exposure Reproducibility. The coefficient of variation of exposure shall not exceed 0.10 when all technique factors are held constant. This requirement shall be deemed to have been met if, when four exposures are made at identical technique factors, the value of the average exposure (E) is greater than or equal to 5 times the maximum exposure (Emax) minus the minimum exposure (Emin):

$$E \geq 5 (E_{\max} - E_{\min}).$$

(g) Additional Requirements Applicable to Certified Systems Only. Diagnostic x-ray systems incorporating one or more certified component (s) shall be required to comply with the

The exposure from an x-ray machine must be consistent at each setting.

following additional requirement (s) which relate to that certified component (s).

(1) Reproducibility. When the equipment is operated on an adequate power supply as specified by the manufacturer in accordance with the requirements of applicable Federal standards, the estimated coefficient of variation of radiation exposures shall be no greater than 0.05, for any specific combination of selected technique factors.

Section F.7 Intraoral Dental Radiographic Systems. In addition to the provisions of F.3 and F.4, the requirements of F.7 apply to x-ray equipment and associated facilities used for dental radiography. Requirements for extraoral dental radiographic systems are covered in F.6.

(a) Source-to-Skin Distance. X-ray systems designed for use with an intraoral image receptor shall be provided with means to limit source-to-skin distance, to not less than:

- (1) 18 centimeters if operable above 50 kVp, or
- (2) 10 centimeters if not operable above 50 kVp.

(b) Field Limitation.

(1) Radiographic systems designed for use with an intraoral image receptor shall be provided with means to limit the x-ray beam such that:

(a) if the minimum source-to-skin-distance (SSD) is 18 centimeters or more, the x-ray field, at the minimum

Pertains to intraoral radiation machines.

If you use an intraoral x-ray machine, there are specific requirements for the size of the x-ray beam and the distance from the source of the x-rays to the patients skin. Most dental x-ray machines are manufactured to meet these requirements.

SSD, shall be containable in a circle having a diameter of no more than 7 centimeters; and

(b) if the minimum SSD is less than 18 centimeters, the x-ray field, at the minimum SSD, shall be containable in a circle having a diameter of no more than 6 centimeters.

(c) Timers. Means shall be provided to terminate the exposure at a preset time interval, preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. In addition:

(1) It shall not be possible to make an exposure when the timer is set to a “zero” or “off” position if either position is provided.

(2) Reproducibility. With a timer setting of 0.5 seconds or less, the average exposure period (T) shall be greater than or equal to 5 times the maximum exposure period (T_{\max}) minus the minimum exposure period (T_{\min}) when 4 timer tests are performed:

$$T \geq 5 (T_{\max} - T_{\min}).$$

(3) Accuracy. Except for certified systems, means shall be provided to terminate exposure at a preset time interval, preset product of current and time, or preset number of pulses. Such means shall produce a time interval, product of current and time, or number of pulses within ten percent of the indicated preset value.

The x-ray timer must be accurate and shall stop x-ray production at a preset time.

(d) X-ray Control.

(2) Each x-ray control shall be located in such a way as to meet the following requirements:

(i) stationary x-ray systems shall be required to have the x-ray control permanently mounted in a protected area, so that the operator is required to remain in that protected area during the entire exposure

(3) The x-ray control shall provide visual indication observable at or from the operator's protected position whenever x-rays are produced. In addition, a signal audible to the operator shall indicate that the exposure has terminated.

(e) Exposure Reproducibility. The coefficient of variation shall not exceed 0.10 when all technique factors are held constant. This requirement shall be deemed to have been met if, when 4 exposures are made at identical technique factors, the value of the average exposure (E) is greater than or equal to 5 times the maximum exposure (E_{max}) minus the minimum exposure (E_{min}):

$$E \geq (E_{\max} - E_{\min}).$$

(f) kVp Accuracy. Except for certified systems, the true value of kVp shall not be different from the indicated value by greater than ten percent.

(h) Additional Requirements Applicable to Certified Systems Only. Only diagnostic x-ray systems incorporating one or more certified component(s) shall be required to comply with the

The exposure from an x-ray machine must be consistent at each setting.

The kilovoltage (kVp) of the x-ray machine must be accurate.

following additional requirements(s) which relate to that certified component(s).

(1) Reproducibility. When the equipment is operated on an adequate power supply as specified by the manufacturer, the estimated coefficient of variation of radiation exposures shall be no greater than 0.05, for any specific combination of selected technique factors.

Section J.11 Posting of Notices to Workers.

(a) Each licensee or registrant shall post current copies of the following documents:

(2) The license, certificate of registration, conditions or documents incorporated into the license by reference and amendments thereto.

(c) Agency MDE 279 “Notice to Employees” shall be posted by each licensee or registrant as required by these regulations.

Post the certificate of registration.

Post the “Notice to Employees” (Form MDE 279) in a conspicuous place.

This posting has the Agency’s emergency number, employee and employer’s responsibility.

This form can be obtained by calling the Agency.

Appendix A: The Dental Inspection Process

General information pertaining to dental inspections:

Currently all dental facilities are inspected every three years.

The dental facilities are contacted and appointments are scheduled up to 30 days in advance.

It is up to the dentist's discretion whether patients should be scheduled during the time of an inspection. It seems to be more convenient for the inspector if patients are not scheduled due to the equipment and the accessibility of the room(s).

An unannounced inspection could be held if there is a complaint from an employee or the general public.

If the radiation machine has more than one tube head it should be denoted on the tube head and the control panel when in use.

All operators must be licensed through the Department of Health and Mental Hygiene

The dental inspection process involves inspecting the following items:

Radiation Machine

- Minimum patient exposure
- Operator Protection
- Protective Apparel Available
- Timer Accuracy and Reproducibility
- Exposure Reproducibility
- Minimum Filtration (Half Value Layer)
- Field Size

Administrative

- Current Registration
- Personnel Monitoring
- Notice to Employee Posting
- Registration Certificate

Film Processing

- Development Speed
- Film Fog
- Chemistry Log
- Film Processing Quality Assurance

Approximate time taken on each dental radiation machine and film processing:

- 30 minutes per Intraoral.
- 45 minutes per Panororal.
- 45 minutes per Cephalometric.
- 45 minutes for film processing

During a dental inspection, the Agency requests that the following documentation be present at the facility:

1. Radiation Machine Registration Form (RX1) – must be available
2. The Registration Certificate – must be posted
3. Personnel Monitoring Records – records must be kept at the facility (monitoring requirements: turn in the badges monthly then monitor for 6 consecutive months or turn in the badges quarterly then monitor for 1consecutive year)
4. Notice to Employee Posting – must be posted
5. A log of processing solution changes – a log must be maintained which shows when the processor was cleaned, solutions changed, and maintenance

Appendix B: Partial List of Registered Service Providers

This is a partial list of Maryland registered service companies located along the East Coast that can provide service on an x-ray machine (example: service, removal, or installation). For a complete listing of all registered service providers, please contact the Agency at 410-631-3300 or within Maryland call 1-800-633-6101.

Company	Name 2	Agent	Address	City	ST	Zip	Tel No
Accelinear Service	Company, Ltd.	PHILIP R. PODMORE	465 North Franklin Turnpike, Suite 2	Ramsey	NJ	07446	(201) 825-6960
Accurate	Imaging in Medicine	NELSON, OWNER JEFFREY L.	7025 Hames Ct.	Frederick	MD	21703	(301) 662-5427
Advanced	Imaging Technologies LLC	RICHARD KELLER	382 Kelly's Court	Westminster	MD	21157	(410) 848-6732
AFP imaging Corp.	DENT-X International	D. VOZICK, CHAIRMAN	250 Clear Brook Road	Elmsford	NY	10523	(914) 597-6100
Air	Techniques, Inc.	PORTNEY, LLOYD	70 Cantigue Rock Road	Hicksville	NY	11801	(516) 433-7676
American OBGYN, Inc.	Spectrascan Health Services, Inc.	Lorie Haskins Dir. Quality Assurance	8 Griffin Rd. North	Windsor	CT	06095	800-243-4351
Applied	Specialties, Inc.	POULIOT, PRES. RICHARD H.	10101 F Bacon Drive	Beltsville	MD	20705	(301) 595-5395
Associates in Medical Physics		ARNOLD M. ABLE	11205 B Lockwood Drive	Silver Spring	MD	20901	(301) 681-8530
Austin & Associates, Inc.		AL AUSTIN	1109 Sturbridge Road	Fallston	MD	21047	(410) 877-3029
Ayres	Equipment Service	AYRES, PRES. CARL	300 Chestnut Avenue	Stratford	NJ	08084	(609) 435-5043
Bay Biomedical		FRANK D. LNSLEY	2227 Harwood Lane	Bowie	MD	20716	(301) 352-6234
Beach's	Dental Equipment Service	BEACH, OWNER VICTOR	1176 Beaver Street	Hastings	PA	16646	(814) 247-8701
Becker-Parkin	Dental Supply, Inc.	BILL GLICK/Tim Harper	11 Q Gwynns Mills Court	Owings Mills	MD	21117	(800) 363-2525
Becker-Parkin	Dental Supply, Inc.	Martin W. Cosimo, VP	One Fulton Avenue	Hempstead	NY	11550	(800) 735-5333
Benco	Dental	Michael Page	1201 Seven Locks Road	Rockville	MD	20854	301-738-9072
Bionix	LLC	Terry Schwalenburg	106 Corporate Park Drive Suite 106	White Plains	NY	10604	(914) 694-5946

Appendix B: Partial List of Registered Service Providers

Brock	Dental, Inc.	BROCKLEY, RICHARD, PRESIDENT/CEO	200 Maryland Avenue Suite 1	Cambridge	MD 21613	(410) 221-7504
Caligor Medical		AUTHUR B. MORAN	846 Pelham Parkway	Pelham Manor	NY 10803	(800) 225-9906
Chesapeake	Medical Systems, Inc.	HALSEY, MICHAEL;CO- OWNER	118 Cedar Street	Cambridge	MD 21613	(410) 228-0221
Chesapeake	Dental Co.	GILLESPIE, OWNER KENNETH P.	2002 Eastern Avenue	Baltimore	MD 221231	(410) 342-0784
Columbia	Imaging, Inc.	HORSEMAN VP,WAYNE M.	P.O. Box 2875	Columbia	MD 21045-0875	(410) 792-2233
Columbia	Imaging, Inc.	HOLSEY,PRESIDENT, JOHN R.	P.O. Box 2875	Columbia	MD 21045-0875	(410) 792-2233
Columbia Dental Associates		DEAN WATERS	P.O. BOX 2942	Laurel	MD 20708	(410) 525-4055
Columbia Medical Inc.		WALTER W. WEEMS	6770 Oak Hall Lane, Suite 121	Columbia	MD 21045	(410) 995-6202
Comprehensive Physics & Regulatory Control Screening	Services, LTD	WILLIAM WALKER	11928 Robb Lane	Lovettsville	VA 20180	(540) 822-4188
		GERALD C. GAUDREAU, RAD CONTROL MGR	2 Gardner Road	Fairfield	NJ 07004	(973) 276-6161
CPRS,Ltd		JOSEPH H. BOWMAN	1200 Dunsinane Hill	Chester Springs	PA 19425	(610) 827-9701
Dalco	Medical Products, Inc.	PRESIDENT, LAMAR MYERS	2300 Essex Street	Baltimore	MD 21224	(410) 276-2500
Delta Scientific, Inc.		LOUIS D. SIMMERS	1979 Stout Drive, Bldg 5	Ivyland	PA 18974	(215) 443-5766
Dental	Repair Service	TIPPET, OWNER WILLIAM T.	102 Crabb Avenue	Rockville	MD 20850	(301) 424-2622
Dental	Equipment Specialist, Inc.	IREY, MELODYE	14210 C Sullyfield Circle	Chantilly	VA 20151	(703) 803-9396
Diagnostic Imaging		MARK BAMMERT	8015 Route 130 South	Delran	NJ 08075	(800) 659-9729
Donald A. McRae, Ph.D.			5301 Westbard Circle #218	Bethesda	MD 20816	(301) 907-8699

Appendix B: Partial List of Registered Service Providers

Ecology	Services, Inc.	OSBORNE, TIMOTHY W.	10220 Old Columbia Road Suite F	Columbia	MD	21046	(410) 381-2600
Equip		ROBERT CANNON	5713 Industry Lane Suite 56	Frederick	MD	21704	(301) 668-9440
Fischer Technology, Inc.		PETER RAFFELSBERGER	750 Marshall Phelps Road	Windsor	CT	06095	(860) 683-0781
Gavin Watson, University of MD	Baltimore County	GAVIN WATSON, ASSISTANT PROFESSOR	Physics Dept., 1000 Hilltop Circle	Baltimore	MD	21250	(410) 455-2513
Global Imaging		STEVE DEAVER, B.S.,R.F.,VICE PRES.	2101 Washington Boulevard	Baltimore	MD	21230	(410) 685-3118
Golden	Engineering, Inc.	SHAWN MUNN	6364 Means Road	Centerville	MD	47330	765-855-3493
Health Physics Consultation		ROY F. HELTZEL JR.	464 Investors Place, Suite 206	Virginia Beach	VA	23452	(757) 518-9523
Heimann	Systems Corp.	James D. Nabors	30 Hook Mountain Road	Pine Brook	NJ	07058	(973) 830-2100
Henry Schein		RICH MIRANDA	2405 York Road Suite 303	Timonium	MD	21093	(410) 308-8806
Henry Schein		RICH MIRANDA	41 Weaver Rd	Denver	PA	17517	(717) 335-7230
Henry Schein Inc.		RICH MIRANDA	110 Hillman Drive	Chadds Ford	PA	19317	(610) 358-1905
Hologic	Incorporated	RICHARD L FOLLETT DIR.REG AFFAIRS	35 Crosby Drive	Bedford	MA	01730-1401	(781) 999-7300
Howard Amols	Dept. Radiation Oncology	COLUMBIA UNIVERSITY	622 West 168 Street	New York	NY	10032	(212) 305-2993
Imaging Engineers, LLC		BRUCE WILLIAM KREBS	7612 2nd Street	Pasadena	MD	21122	(410) 255-8091
INTRAMED, INC.		ROBERT J. LEONAVICIUS	P.O. Box 408	West Friendship	MD	21794	(410) 489-4246
Irradiation Industries	Incorporated	BRIAN M. BOZZARTO	1 Metropolitan Grove Ct.	Gaithersburg	MD	20878-4097	(301) 840-0900
Joseph E. Fishel			4900 77th Place	Hyattsville	MD	20784	(301) 459-6368
Kane	X-ray Company, Inc.	KANE, DANIEL KANE	2134 Espey Court Suite 12	Crofton	MD	21114	(410) 721-6969
Keystone	Dental X-ray Inc.	ROBERT HAY RSO; ED MARANDOLA OWNER	1910 North Penn Road	Hatfield	PA	19440	(800) 946-8989

Appendix B: Partial List of Registered Service Providers

Krueger-Gilbert	Health Physics, Inc.	KRUEGER, SUZANNE	3601 East Joppa Road	Baltimore	MD	21234	(410) 665-5447
L & W Research, Inc.		PAUL LEEK	112 Front Avenue	West Haven	CT	06516	(203) 931-7870
MacPherson Associates	Yoshida /Kaycor	D. MARK DEVORE	1104 Vernal Street	Gambrills	MD	21054	(410) 695-1771
Margraf	Corp.	MARGRAF, Barry	611 Harper Ave. Box 2004	Jenkintown	PA	19046	(215) 884-0369
Maryland Medical Electronics, Inc.		DAVID BROWN	3638 Lochearn Drive	Baltimore	MD	21207	(410) 597-8137
Maryland Office Relocators,	LLC	RICHARD N. SCHMEETZLER	6605 Selnick Drive	Elkridge	MD	21075	(410) 379-3000
Medica, L.L.C.		TORI TUNNELL TOMLINSON	8927 Shady Grove Court	Gaithersburg	MD	20877	(301) 926-6099
Medical	Physics Services, Inc.	STRUBLER, KENNETH	8106 Halton Road	Towson	MD	21204	(410) 828-2540
MED-PRO Image	Developing Service, Inc.	PETER SALVANO	303 Westridge Drive	Mt. Airy	MD	21771	(410) 549-0269
Microcosm, Inc		WAYNE E. MOORE, PHD	9140 Guilford Road, Suite O	Columbia	MD	21045	(301) 725-2775
Mid-Atlantic	Radiation Physics, Inc.	DWIGHT W. GLENN,PHD,DABR	7233-D Hanover Parkway	Greenbelt	MD	20770	(301) 345-6803
Mike Woods & Associates, Inc.	FluoroScan dealer	MIKE WOODS	10700 Henderson Road	Fairfax Station	VA	22039	(703) 425-6453
Novartis Pharmaceuticals Corp	Senior Center	ANNA M. FAIN	10111 Cedar Lane	Kensington	MD	20895	(301) 532-9846
Nucletron	Corporation	HOWARD ROE, RALPH SHUPING	7080 Columbia Gateway Drive	Columbia	MD	21046	(410) 312-4103
Nu-Serv	,Inc.	SMITH, PRES. DAVID R.	6402 Locust La.	Sykesville	MD	21784	(301) 377-3759
Oxford Instruments	America, Inc.	SAM KLAIDMAN	130A Baker Avenue EXT	Concord	MA	01742	(478) 369-9933
Patterson	Dental Supply	JOHN VOGEL	8975 Henkels Lane, Suite 700	Annapolis Junction	MD	20701	(301) 210-1050
Pemco	Corporation	MINTER RSO, JAMES B.	5601 Eastern Avenue	Baltimore	MD	21224	(410) 631-4380
Pennsylvania	Medical Imaging	Edward A. Spector	13 Hickory Avenue	Chalfont	PA	18914	(800) 966-6473

Appendix B: Partial List of Registered Service Providers

Peterson Imaging, Inc.		DAVID T PETERSON, PRES.	479 Shoemaker Road, suite 110	King of Prussia	PA 19406	(610) 337-7880
Philips Analytical Inc.		VARRICK S. NUNEZ	12 Michigan Drive	Natick	MA 01760	(508) 647-1130
Philips Medical Systems		JACQUELINE ARCHER EXT. 2304	150 CLEARBROOK RD	ELMSFORD	NY 10523	(800) 833-3316
Picker	International, Inc.	JOHN MACMILLAN/OPERATION S MANAGER	2540 Metropolitan Drive	Trevese	PA 19053	(215) 953-7900
PMD Services		PERRY M. DEMARS	8652 Passapatanzy Road	King George	VA 22485	(202) 784-3318
Proxtronic, Inc.		JOAN L. DAVIS	7200 Fullerton Rd Unit B-1	Springfield	VA 22015	(800) 435-4811
Radiation	Physics, Inc.	RUBIN, PRES. LOUIS M.	10133 Bacon Drive	Beltsville	MD 20705	(301) 937-4072
Radiation Protection	Services	SCOTT BENJAMIN	1153 Route 3 North, Suite 82	Gambrills	MD 21054	(410) 451-5581
Radiological	Health & Protection, Inc.	MICHAEL A. COOGAN, SR., MS	6695 Hanson Lane	Lorton	VA 22079	(703) 550-5616
Reliant Medical Systems	,Inc.	JOSEPH B. FRITZGES, NEIL ROBSON	2600 Cabover Drive Suite M	Hanover	MD 21076	(410) 766-3311
Robert M. Kepner		ROBERT M. KEPNER	16452 Spielman Road	Williamsport	MD 21795	(301) 223-6309
Robert S. Weir		ROBERT S. WEIR	15980 Meandering Drive	Brandywine	MD 20613	(301) 579-6030
Ronald	W. Goetzke	GEOTZKE, OWNER RONALD W.	4108 Pine Hill RD (ltr 6/96)	Baltimore	MD 21236	(410) 256-3674
RSO	,Inc.	GREGORY D. SMITH, GENERAL MGR	P.O. Box 1450	Laurel	MD 20725-1450	(410) 792-7444
Schick Technologies, Inc.		ENRICO RENZI	31-00 47th Avenue	Long Island City	NY 11101	(718) 937-5765
SCI Systems	Inc.	NEAL E,REEK	10947 Golden West Drive Plant 40	Hunt Valley	MD 21131	(410) 771-5876
Scientific Systems		STANLEY GOODMAN	14300 Gallant Fox Lane, Suite 212	Bowie	MD 20715	(301) 262-4104
Siemens	Medical Systems, Inc	WINFRED HOFFMAN	186 Wood Avenue South	Iselin	NJ 08830	(732) 321-4500

Appendix B: Partial List of Registered Service Providers

Siemens	Medical Systems, Inc.	CLARK, THOMAS ; SUPERVISOR	105 Gamma Drive	Pittsburgh	PA	15238	(412) 967-2711
Standard Medical/MedImaging	Technology	Everett Bollin Director	9002 Red Branch Road	Columbia	MD	21045	(410) 997-1500
Sterling Services, Inc.		STEVE COCKE VP, RON FLEES, PRES.	14240G Sullyfield Circle	Chantilly	VA	20151	(703) 968-4311
Sullivan-	Schein	FRANK PESALE	135 Duryea Road	Melville	NY	11747	(631) 843-5930
Sullivan-Schein	Dental	RICH Miranda/Robert Stevens	8435 Helgerman Court	Gaithersburg	MD	20877	(301) 519-8105
SURE-N-TERPRISES		NILESH KOTHARI	P.O. Box 1675	Frederick	MD	21702	(301) 698-0778
T.	R. Houston, Inc.	THURSTON, JR., GILBERT D.	18450 Showalter Box 102	Hagerstown	MD	21742	(301) 790-2980
TAS INC	PAMELA A. HOFF	ROBERT LAMOE	8520-F Corridor Road	Savage	MD	20763	(410) 880-1890
Tel-Atomic	Inc.	STARLING, STEPHEN	1223 Greenwood Ave.,P.O. Box 924	Jackson	MI	49204	(517) 783-3039
Thermo Radiometrie Corp.		MICHAEL A. NORBURY JR.	9298 Gaither Road	Gaithersburg	MD	20877	301-948-2450
Thompson Dental Company		RUSSELL CORBET	240 Business Center Drive	Reisterstown	MD	21136	(410) 526-9500
Toshiba	American Medical Systems	O'LEARY, MICHAEL P.	486 Thomas Jones Way	Exton	PA	19341	(800) 543-1817
United Medical Systems	Lithotripsy	JAY KREBS, SERVICE ENGINEER	1 Technology Drive 3rd floor	Westborough	MA	01581-1786	(508) 870-6565
United Medical Technologies LLC		TERESA SMITH	9002 Red Branch Road	Columbia	MD	21045	(410) 964-9453
Universal	Medical Services, Inc.	REEDER,TREASURER ROD	823 Third Avenue	Beaver Falls	PA	15010	(724) 846-4138
University of MD	Baltimore County, Physics Dept	ROBERT C. RENO	1000 Hilltop Circle	Baltimore	MD	21250	(410) 455-2513
Walter	L. Robinson & Associates	WALTER L. ROBINSON	2624 Spring Valley Road	Lancaster	PA	17601	(717) 291-9813
Xitec		LARRY ASHTON	4 New Park Road	East Windsor	CT	06088	(860) 627-7500

Appendix B: Partial List of Registered Service Providers

X-ray Calibration and Compliance	Services, Inc.	KEN TRAVIS	8123 Truro Court	Springfield	VA 22152	(703) 644-5655
X-Ray Engineering	Company of VA, Inc.	BOB AUVIL, SALES IN MD	708 Dawn Street	Richmond	MD 23222	(804) 321-3033

Appendix C: Reasons A Dental Registrant May Notify the Agency

Notification to the Agency is deemed necessary when one of the following situations arises:

Relocation

1. Submit a written letter requesting cancellation of your old registration number.
2. Submit disassembly reports showing the Agency what happened to the radiation machines located at the facility.
3. Submit installation reports showing the Agency how many radiation machines were installed at the new location.
4. All outstanding fees must be paid on the old registration number before the registration number is cancelled.
5. A Radiation Machine Registration Form (RX1) must be completed and annual fees paid before a new registration number is issued.

Ownership Change

1. Submit a bill of sale that shows that ownership has changed.
2. All outstanding fees must be paid on the old registration number before the registration number is cancelled.
3. The new owner must complete a Radiation Machine Registration Form (RX1) and fees paid before a new registration number is issued.

Termination of Registration

1. Submit a written letter requesting cancellation of your old registration number.
2. Submit disassembly reports showing the Agency what happened to the radiation machines located at the facility.
3. All outstanding fees must be paid before the registration number is cancelled.

Stolen, Lost, or Missing X-ray machine

1. Notify the Agency immediately by telephone (410-631-3300) that the x-ray machine has been stolen, lost, or missing.
2. Notify the Agency within 24 hours in writing that the x-ray machine has been stolen, lost, or missing.
3. Submit within 30 days a report which details the following: manufacturers name, model, serial number; how the machine was lost or stolen; what happened to the machine, and corrective actions taken.

Note: It is the responsibility of the facility, not the service providers, to notify the Agency of any changes.

Mail all correspondence to: Maryland Department of the Environment
Radiological Health Program
1800 Washington Blvd.
Baltimore, MD 21230

Phone number: 410-537-3300 or within Maryland call 1-800-633-6101